



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

TRADE ROUTES IN THE ECONOMIC GEOGRAPHY OF BOLIVIA*

(Concluded)

BY

ISAIAH BOWMAN
Assistant Professor of Geography
Yale University

PARAGUAY-SANTA CRUZ

One of the oldest trade routes in South America is that from the plateau section of Bolivia to the Paraguay. Three facts have in the past restrained trade from following this route in increasing amounts. The Gran Chaco, across which the way lies, is insufficiently watered, except in its northern part. It forms an extension into Bolivia of the piedmont plains of Argentina, and its porous sands and gravels absorb the limited rainfall and thus diminish the value of the tributaries of the Paraguay for purposes of navigation. The flood plains are either inundated or too dry; the channels of the streams are marked in the dry season by innumerable snags and shallow and braided water courses. The hostility of the Indians of some sections of the region has been a second source of discouragement, while a third has been the directer course which the Amazon and its tributaries afford to European markets, besides their greater navigability at all seasons of the year on account of their location in a belt of heavier and more constant rainfall.

Repeated attempts have been made to develop some route to the Paraguay. Early in the history of the Spanish missions a cart road was opened to the present location of Santa Cruz, one of the most isolated cities in Bolivia to-day. Crevaux, the Stanley of South America, lost his life in 1882, in trying to explore the possibilities of the Pilcomayo.† Only in 1905-1906 was that river finally explored to the satisfaction of the Bolivian and Argentinian interests and found to be wholly unsuited to transportation on a commercial scale.‡ In 1879 Minchin§ opened up 50 miles of track through

* See *Bulletin*, January, p. 22, and February, p. 90.

† Süd und Mittel Amerika; W. Sievers, 1903, p. 29.

‡ The River Pilcomayo from its Discharge into the River Paraguay to Parallel 22° S. Gunnar Lange. Buenos Aires, 1907. See also El Comayo. S. V. Guzman. Buenos Aires, 1880.

§ Eastern Bolivia and the Gran Chaco. J. B. Minchin. *Proc. Royal Geog. Soc.* (London), vol. 3, 1883, p. 410.

dense, dry thorny scrub to the Parapiti from San José. No water could be found in all this distance, while borings to 26 feet were likewise unsuccessful. He describes the Indians as able to sustain themselves for long periods by the water found between the vertical

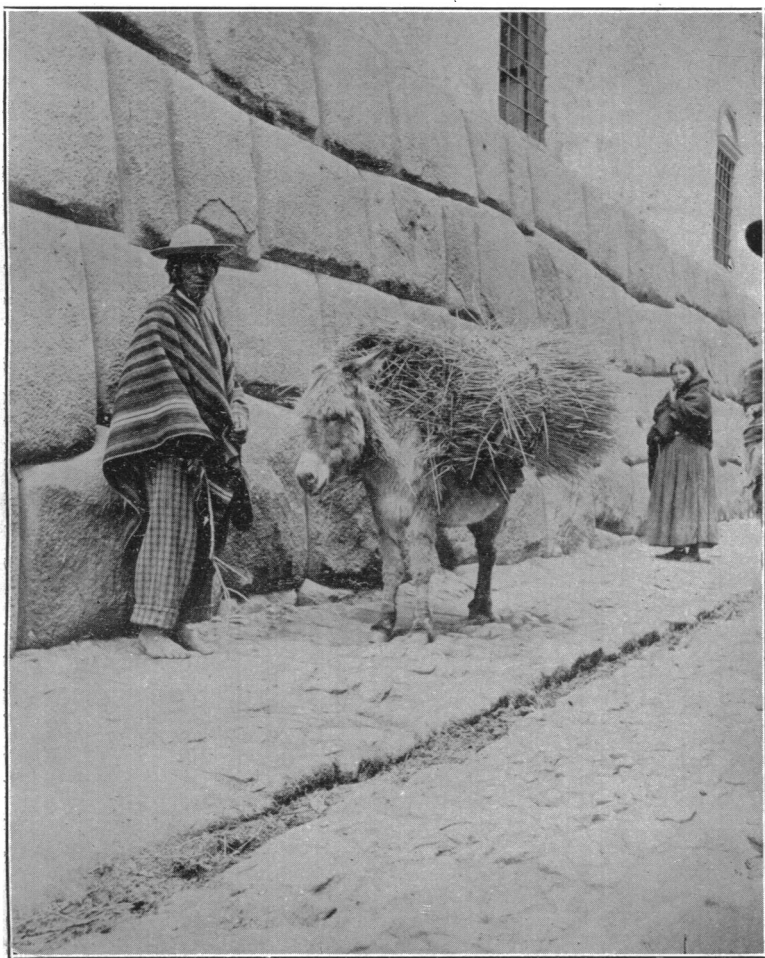


FIG. 16.

A common means of conveyance in Bolivia and Peru. Taken at Cuzco, 1907.
Donkey loaded with straw used for fuel.

leaves of the cactus or that squeezed from large pulpy water potatoes.

The trade of the region is similar to that of the northerly regions of the Yungas and the Beni, with the addition of a greater amount

of hides, chocolate, and cinchona bark, and some products not produced farther north, such as sugar, rice, etc. The carrying has always been done more generally by ox carts than by mules. These are great, lumbering, uncertain vehicles, inexpressively slow, which follow not roads, but mere tracks 2 to 3 yards wide. While the superior navigability of the tributaries of the Mamoré has drawn much trade to the Amazon, some commerce persists toward the east and south. Even some rubber is shipped south from the Chiquitos and Mojos plains to Santa Cruz, to be taken by a one to two or more months' ox-cart journey of 400 miles to Corumbá, on the Paraguay. The return merchandise is of the general sort, already described, for the Chaparé. Insects, tigers and disease reduce the draught animals on the route and delay shipments. Rubber cargoes, following the loss of the draught animals, have in some instances lain two years beside the road awaiting shipment. Minchin states* that in the early '80's the rate from Santa Cruz to Corumbá, 400 miles,† was £43 per ton; from Santa Cruz to Cochabamba, 250 miles, or Sucre, 200 miles, £32; Santa Cruz to Jujuy (Argentina), 570 miles, £38 8s.; and from Buenos Aires to Corumbá, 1,500-1,600 miles (by steamer), £5 12s. What the Madeira falls have meant in money and toil to the traffic of the southwestern portion of the Amazon basin the unnavigable streams of southeastern Bolivia have meant, in an equal degree, to that section.

The increase in the cost of articles, conditioned by the mere transportation of them, is illustrated by the salt imported to the cattle farms at Trinidad and Villa Bella from the plateau of Bolivia. On the salars of the great central basin, the *alti-plano*, it is extremely cheap in its natural condition, in most cases absolutely free. Llama caravans convey it to Cochabamba, where it is shipped by mule caravan to Santa Rosa, at the head of navigation. Its cost on the plateau is, let us say, nothing, at Santa Rosa it is 15 cents gold per pound, and at Trinidad, a two weeks' journey below Santa Rosa, it is 30 cents gold per pound! The article is not only high-priced, but the cost is wholly due to the transport labor expended on it. High as is the cost of this commodity it is indispensable, not only to man, but to his beasts. The craving of tropical peoples for salt may be compared to that of temperate peoples for sugar, and in both cases is satisfied by the transportation of these products on a large scale

* *Ante*, p. 411.

† Distances here again are approximate, and are taken from Franz Germann's *Mapa de la Republica de Bolivia*, 1904; and from Andree's *Allgemeiner Handatlas*, 1904. They are more or less direct and if taken along the curves of the trail would be from 10 to 25 per cent. longer.

and often for great distances, even if primitive means are the only ones provided. Thus at the oasis of Tāudeni, in the Sahara, 350 miles north-northwest of Timbuctu, are certain famous mines which produce great quantities of salt, that is shipped to the Niger valley, the cost increasing with every mile of the journey southward, and the same is true of the salt conveyed from the northern Sahara over the old caravan road from Tafilet. Lawes* mentions the same great craving for salt on the part of the natives of New Guinea, and numerous other instances might be cited from tropical lands where the great moisture prevents the accumulation of salt deposits.

The railroad development of the Gran Chaco region had its beginning in the extension of the Argentine lines to Corrientes on the Paraguay. In 1907 work was begun to extend this line up river toward Corumbá, while at Corumbá itself the line is being surveyed westward. The construction of this road has undoubtedly been stimulated by the coöperation of the American-Canadian syndicate, in connection with the São Paulo-Rio Grande railway in Brazil. Aside from the main lines near the coast or in the coastal provinces, there will be an extension 600 miles long into the interior of the country to Iguassú Falls, starting from the port of San Francisco. This line will open up Paraguay to the Atlantic by rail and by means of the Paraguayan railways, now existing or under concession, will connect with the new Bolivian railways ultimately to extend to Sucre, Santa Cruz and the Paraguay River at Corumbá. The considerations applied to the trade routes of the headwaters of the Madeira apply with only slightly diminished force to the southeastern route. The utilization of the water power of the mountainous border of the tableland and the stimulation of production afforded by improved transportation methods will mean the creation of new population groups and the rebirth of the old ones in the extensive and potentially wealthy grass lands of Chiquitos and adjacent provinces and in the fertile Andine valleys bordering them on the west. The completion of any one of these lines to the east, to Cochabamba or Sucre and the plains, would seem to be the most compelling project in Bolivia's entire plan for development. The enduring riches of that country—the fertile soil, the rainfall, the abundant pastures of her eastern basins, valleys and plains—these are in great measure shut off from the tableland above. This great trans-montane area has every favorable quality which the

* An Excursion in the Interior of New Guinea; W. G. Lawes, *Proc. Royal Geog. Soc.*, vol. 15, 1883, p. 357.

plateau lacks, except its vernal climate; and the equalization of upland and lowland products, now carried on under extremest difficulties, would, through a railway, become easy and complete.

Sugar and rice would then come, not from the United States and Germany, but from Santa Cruz, where some quantities are now derived. Wood, the great lack of the *alti-plano*, both for fuel and lumber, would be in great measure accessible; and the products of the flocks and herds of the plains, now as sadly wasted on the plains as they are needed on the plateau, would find a ready market, to the great encouragement of the grazing industry. And the limits of that industry are only to be expressed in terms of the well-nigh boundless plains that would support it. For this southwestern section of Bolivia the greatest promise lies in such a railway from Corumbá to Santa Cruz. The greater width of the eastern Andes, in the latitude of Santa Cruz, excludes this city and region from early participation in the plateau railroad scheme. Its natural riches, however, make it one of the most promising portions of Bolivia. Both Minchin and Church, the two best authorities on the region, have recorded their enthusiastic belief in its bright future. Certainly every fact of its development at the present time points toward the confirmation of their results. In spite of the greatest difficulties, the region continues to grow, and to-day fairly demands an outlet to the Paraguay. A comparison of costs, labor supply and healthfulness with the Amazon route would favor Santa Cruz for shipments from the whole Chiquitos province. Its position at the northern end of the Gran Chaco gives it a climate which compares favorably with that of the plateau. It would be unthinkable that, so fortunately situated with reference to climatic belts, the Paraguay and the Atlantic, it would yet find an outlet to the Pacific over a trans-Andine railway. Steamers of 9-foot draught can now go to Asuncion and boats of 3-foot draught can reach Corumbá, 2,000 miles from Buenos Aires.*

RAILROADS OF THE BOLIVIAN TABLELAND

The center of interest and of actual construction of strictly Bolivian railways is the plateau section between La Paz† and Oruro. The Bolivian government has contracted with the Speyer syndicate, of which Grace & Co. are the purchasing agents, and the National City Bank of New York the financial agents, to spend the \$10,000,-

* *Ante*, p. 156.

† It would be more correct to say Viachi—the station a few miles out of La Paz on the La Paz-Molendo line, which is the terminus of the Oruro line.

ooo paid to it by Brazil in the building of over 300 miles of railway to cost \$27,766,000. The difference between these two figures is to be covered by bonds upon the railways themselves. Half of the 300 miles is the line between La Paz (Viachi) and Oruro. The rest consists of branch lines to Cochabamba, Sucre, Tupiza and Potosi. The Tupiza section will form a connection with the Argentine lines, the Cochabamba section will be an extension toward the plains, while serving the interests of one of Bolivia's four largest cities, and the Potosi line will eventually be extended to Sucre, which lies in much the same relation to the northern Gran Chaco as Cochabamba does to the Yungas territory. From Sucre

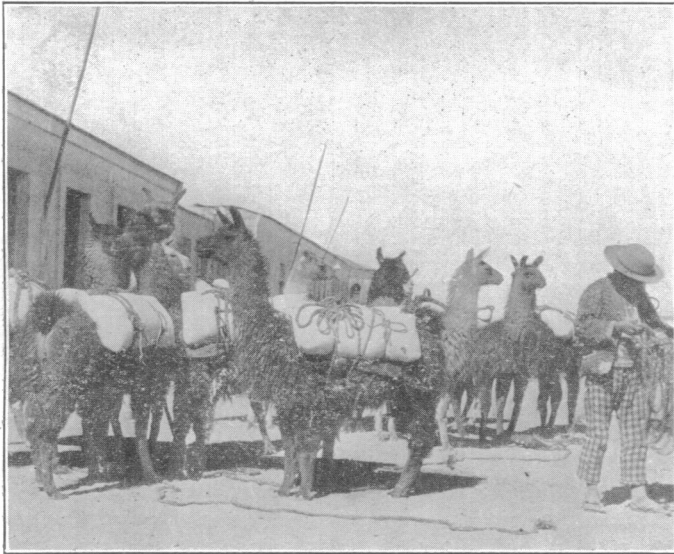


FIG. 17.

Drove of llamas loaded with Oregon flour starting on a two week's journey from Challapata to Sucre, Bolivia.

the natural continuation to Santa Cruz, thence across the Gran Chaco, via San José and the present ox-cart track, to Corumbá, the northernmost camp of the Brazilian lines, extended to and beyond Paraguay from the Brazilian coast at San Francisco. These lines have been "located" as far as Tupiza, Cochabamba and Potosi, and grading has been completed over the basin portion of the Potosi line, and for 30-40 kilometres from Oruro toward Cochabamba.

The immediate service of this important connection is apparent from a glance at the map of Bolivia. The two existing lines to

Bolivia are from coast ports 600 miles apart, while the land termini are 150 miles apart. Now 150 miles of land transport between the only two existing railways is an effectual bar to any system of partial transport over both lines. A mine or a store, located upon one or the other of the lines, was subject, without redress, to the pre-vaillingly high tariffs that have marked the operations of these lines. This has been the history of railroad after railroad in South America. Every one has been characterized by a single track from the coast. Without competing trans-continental routes, without competition or even the barest chance of it in the coast valleys or upon the plateau, rates but slightly lower than those upon cart transportation to the coast, or in the case of the more remote locations, all that the old and the created traffic would bear, could be charged with the full knowledge that they would be paid. A railroad under these circumstances has been more profitable* to exploit than the incredibly rich mines it served or the wealthy sugar and cotton plantations it in some cases revived and in others created. A single figure will suffice to illustrate the point; the cost of the Arequipa-Puno section of the Southern Railway in Peru, completed from Mollendo to Puno, on Lake Titicaca, in 1874, was 6,400,000 pounds sterling.† Improvements and extensions have, of course, been made. These and the repairs will raise that figure considerably. The dividends paid to stockholders in 1906-1907 on the account of the railway above are not available, but the general statement of the account of the Peruvian Corporation owning the railway is as follows:‡

The accounts of the Peruvian Corporation for the year ended June 30, 1908, show a profit of £263,203, after deducting the usual charges and interest on the debentures at the rate of £4 per cent. per annum. The board proposes to place £50,000 to reserve, making a total sum of £575,000 to the credit of that account; to make up the debenture interest for the year to the rate of £6 per cent. per annum (by payment of £2 per cent. additional interest on April 1st, 1909); to pay on Jan. 16th, 1909, a dividend of £1 10s. per cent. on the preference stock, amounting to £111,710; to write off £4,280 on colonization account and £2,269 in respect of income tax, and to set aside, as in previous years, £4,000 toward the insurance fund on the lake steamers. These provisions will absorb the above-mentioned profit of £263,203, and, in addition £17,056 from the balance of net revenue shown in the previous year's accounts.

The importation of American goods is assured by the building

* Many of the railways were financially embarrassed for the first years of their existence, but so far as known all have soon become singularly profitable undertakings.

† Railways in Peru. *The Geog. Mag.* (London), vol. 1, April, 1874, pp. 36-41.

‡ *South American Journal*, Dec. 5, 1908, p. 640.

of this connecting line, inasmuch as the purchasing agent is an American concern, better acquainted with the prices, qualities and conditions of shipment of American goods. Their business growth at Oruro and La Paz has been nothing short of phenomenal, and while this is owing in part to their importation of railway material, it is also to a marked degree owing to the prestige which the house has gained through its relation to the railway and the general business thus secured. It is doubtful if any event in recent years has meant so much for our trade with Bolivia as the construction of this short railway by an American concern, with its stimulating effect upon the American business house associated with it. Although the effect is by no means confined to construction supplies, yet it is most marked there. The influence of the American has extended to the other railways of Bolivia and Peru. The new rails used for replacement on the Southern Railway of Peru are made in Pittsburg; over a hundred new modern-type engines recently installed are from Philadelphia; the brass locks on the windows were made at Hartford, Conn.; the car wheels at Ramapo, New York; the ties were imported from Oregon. The list of other American articles one may see upon the docks at Guaqui and in the stores at La Paz are of equal interest. Breakfast foods from Battle Creek, Mich.; condensed milk and cream from the Middle West; tinned meats of every variety from Chicago; shoes, collars, underwear, etc., from New England. These are only a few among many and are a sufficient indication of the hold we are acquiring upon Bolivia's trade, notwithstanding the more general opinion that here, as elsewhere, our trade is languishing, an opinion too widely credited for Peru and Bolivia by virtue of its emphatic repetition. Our share in that trade is still too small, painfully small, but the significant fact is that it is growing. Another decade will see it well established there.

The next great railway improvement affecting the Bolivia Railway Co., through its facilitation of the rapidly growing imports over the Mollendo line, will be the all-rail route around Lake Titicaca. There are now two expensive trans-shipments, unthinkably difficult impediments when conditioned by a lake but 143 miles long. Not only will the commercial needs of the territory the railway serves demand this improvement; it will be strictly enforced upon the company by the competition afforded by the early completion of the shorter, all-land route from La Paz to the better harbor at Arica.

CONCLUSION

The general bearing of this brief study may be summarized as follows: Nearly 90 per cent. of the people and 100 per cent. of the railways are in the southwestern third of the Republic. The shortest land connection between the largest groups of people and a commercial highway is to the Pacific. In a land where labor is so extremely scarce as in Bolivia, and where tropical conditions in its lowlands will prevent dense populations for centuries, the essentials of a trade route are strategic, plateau locations and short routes to the sea coast. Once the coast is gained the principal point is won, for while it might at first sight seem much more advantageous to have down-valley connections with the Atlantic rather than trans-montane connection with the Pacific, the long water route around the Straits of Magellan in large steamers is, in fact, much better than a long and difficult eastern land haul by pack train and canoe and launch at ruinous rates, except on railways; and but little better if the railway is only an auxiliary to the launches and steamers upon the navigable streams. With the Panama Canal completed, Bolivia's ores, rubber, chocolate, wool, etc., will find an even cheaper and a very direct water route to this country, now rapidly increasing her share in the supply of Bolivian merchandise.* The superior silver ores and rubber pay export duty. The other articles in the list are exported duty free, unless exported in ingots, bars or in the form of coin.

The superior carrying capacity of the Pacific steamboat over batelon and canoe and the superior healthfulness of the sea route will for a long time outweigh the possibilities of traffic via the Amazon for the people of the plateau and even a portion of the adjacent plains of Bolivia. The service of the railway extensions to the plains has already been outlined, the essential fact being that the service is chiefly for the ultimate products of the plains dwellers

*According to the figures published in the *Bull.* of the Int. Bureau of Am. Repub. for July, 1908 and 1909 (pp. 69 and 37 respectively), the total foreign trade of Bolivia in 1906 was \$45,347,000; in 1908, \$33,837,000. The United States furnished 6.4 per cent. of Bolivia's imports for 1907, as against 5.6 per cent. in 1906 and 14 per cent. in 1908, Germany leading with 16 per cent. We took 0.32 per cent. of her exports in 1906 as against 0.13 per cent. in 1905. The exports by articles for 1907 are as follows:

Tin	\$18,000,000
Rubber	5,300,000
Silver bullion and ore.....	2,375,000
Copper	1,650,000
Bismuth	575,000
Gold	18,000
Sundries, antimony, lead, etc.....	250,000

and for the equalization of the needs of the plateau groups and the plains groups of peoples. Railways would accomplish miraculous changes upon these plains and would serve to encourage the growing of products which depend absolutely upon rail transportation, but for neither the present products nor the population are such

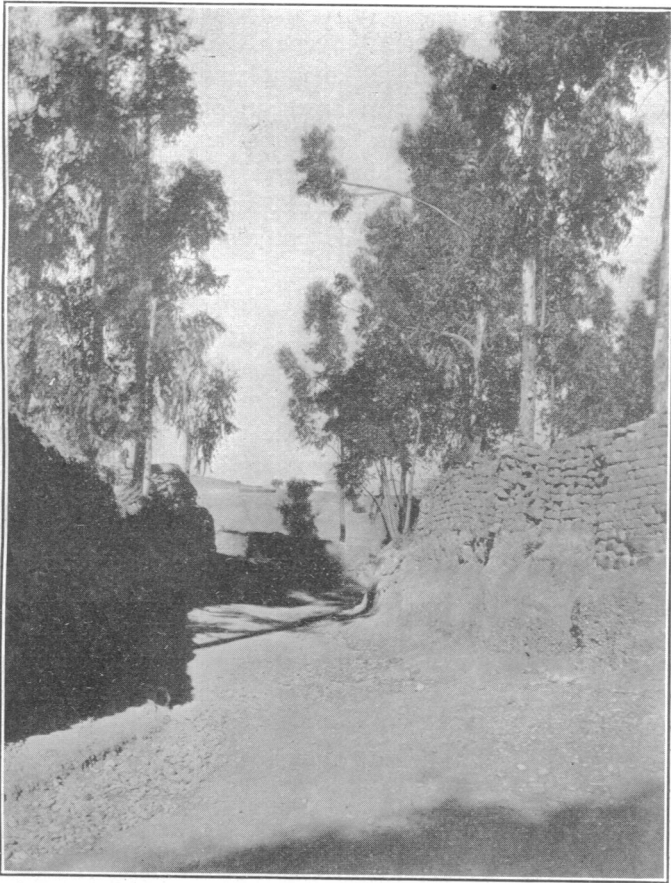


FIG. 18.

An old road at Sacaba near Cochabamba, Bolivia. The road has been used for centuries and with constant wear has been sunk four or five feet below its original level.

The trees and original mud walls are perched high up at the old level.

railways indispensable. The rubber and the chocolate alone, gathered from a thousand scattered sources, do not require, in fact could not themselves support, any safer or speedier facilities than improved launches and wagon roads and short connecting railways

would afford. And they are, by all odds, the chief source of extra-territorial shipments. The goods for the numerous highland towns and peoples on the other hand require swifter shipments, have greater bulk, more concentrated sources of tonnage, and the heaviest shipments are the exports, the down-grade consignments of mineral products to the Pacific Coast. Furthermore, the navigable waterways of Bolivia* already serve much of the plains region, and, in general, serve it fairly well, except at locations similar to those of the Madeira rapids. The plateau and mountain section, in which Bolivia's mineral wealth lies, and where, on account of favorable climate and nearness to mineral resources and the sea, her densest population will long reside, has practically no navigable waters (Lake Titicaca and a portion of the Desaguadero only) and these are interior basin waters, they do not reach the sea. In the one case railways are an improvement, in the other a necessity.

A number of convergent factors operate to-day to hold trade to the old routes to the Pacific. The directive momentum of the railways, themselves an absolute essential in the mineral development of the plateau near the Pacific, are a powerful cause. Ores could never have been handled over the rivers of a tropical jungle. The dangers of travel through a steaming lowland can only become of lesser importance when the exact nature of these dangers is definitely ascertained and tropical diseases prove more generally curable than they are to-day. Furthermore, the population of South America is notably absent from the hot lowlands of Amazonia. Laborers in sufficient quantity for the transport of goods on the navigable rivers of the Amazon basin are conspicuously absent. That defect is, in fact, fundamental to any scheme for the development of Amazonia. There are tributaries of the Negro in northern Brazil, in whose basins rubber trees have been discovered in abundance, but whose resources can not be developed because of the almost absolutely unpopulated conditions of large portions of these basins. Church† was right when he ridiculed the Pacific route for goods destined for Cochabamba and Sucre and Santa Cruz from the single standpoint of mere cost to the merchant and the consumer; but it is not the viewpoint of the merchants in these places, but rather that of the carrier, that must be considered. Lacking carriers on the plains, merchants can only secure carriers

* Bolivia's navigable waters total about 12,000 miles, and are almost wholly in the plains section; her wagon roads about 2,000 miles, between the largest towns; railways now actually in operation, over 400 miles.

† *The Route to Bolivia via the River Amazon*; G. E. Church, 1877, p. 150 et al.

from the plateau; and the plateau dweller, accustomed to aridity, and a healthful climate, has in all the history of South America and Mexico, dreaded the lowlands as he dreads the plague.* These factors are the most intangible and at the same time most potent of all and, therefore, the hardest to estimate. They have been totally overlooked by many writers who are concerned merely with distances and theoretic costs or costs based upon slight movement of goods in a region where, on account of a thin population, any increase of traffic would mean not only a doubling, but a trebling of existing rates. Were the eastern waterways of Bolivia opened to-morrow where would come the labor for operating canoes and batelons? Every student of the region knows how persistently the excuse "Es falta canoas" would be heard to-morrow as to-day, and how much more if traffic sought this route in any considerable quantity. Steam launches would improve conditions, and operating in conjunction with the railway now building about the falls of the Madeira might revolutionize traffic conditions. The difficulties of disease would still be present, however, and to this we must add the great expense for initial construction and upkeep of roads through the precipitous and rainy eastern Andes from the head of navigation to the plateau cities of Cochamba and La Paz. Most of the roads to the western seacoast are *per contra* notoriously good as to road-bed and grade. Comparatively little dissection marks the latter region; the former region possesses some of the profoundest descents and difficult trails it is possible to find.

As contrasted with the Atlantic route, the route west to the Pacific seaboard was in pre-railway days at a certain disadvantage. The Atlantic route had canoe service that was cheaper than the cart service of the western desert mountains and plains. The proximity of the Pacific and the healthfulness of the desert route undoubtedly held traffic to the more arduous way. No one can over-estimate the heat and disease of a flat tropical lowland as factors in keeping traffic to a more difficult and expensive, but less dangerous route. Costa Rica's experiences in this regard are instructive. Early in the 19th century the short, inexpensive, direct way from the relatively dry and more densely inhabited western section (in the lee of the mountains which here intercept the rain-bearing northeast trades) across the central mountains and the tropical lowlands of the east to the Atlantic seaboard was wholly

* Hans Gadow, *Through Southern Mexico*, and numerous other references relating to the Inca civilization, and the present trade routes of Tropical America, the plateau dwellers of Peru, Bolivia, and Mexico, etc.

untried and goods were then almost entirely forced to reach European markets by a voyage around Cape Horn! For a time the Saxapiqui route to the Atlantic was opened for tobacco shipments and European mail, but with the opening of the Panama Railway in 1855, the route "returned to its virgin solitude."*

These facts point to the conclusion that, in spite of the fact that 90 per cent. of Bolivia drains to the Atlantic and 10 per cent. is interior basin drainage with no outlet whatever to the Pacific, the section of the country in which the population is found yet looks toward the Pacific; and chiefly in this direction will she continue for many years to have relations with her commercial friends. Geographic position, the distribution of resources and climate are here equally powerful factors with topography and drainage, and, strange as it may seem, not only make, but will long continue to make the Atlantic slope, not the Pacific slope, the back door to Bolivia.

* Costa Rica; G. E. Church. *Geog. Journ.*, vol. 10, 1897. pp. 56-84.

THE ALPS DURING THE GLACIAL PERIOD*

BY

PROF. JAMES GEIKIE†

Among the most conspicuous evidences of formerly widespread ice-action in the Alpine Lands are the large travelled blocks or *erratics*, so lavishly scattered everywhere. From an early period these attracted the attention of intelligent travellers, some of whom expressed surprise when they saw that the isolated blocks did not consist of the same kind of rock as that of the mountains on which they rested. The numerous gigantic erratics—some as big as cottages—that strew the flanks of the Jura, looking towards the Alps, are often referred to as specially remarkable. Obviously these had been carried to where they are now found—but by what mysterious agency? Some—probably all—had come from the Alps,

* Die Alpen im Eiszeitalter. Von Albrecht Penck, Professor an der Univ. Berlin, u. Eduard Brückner, Professor an d. Univ. Wien. In drei Bänden. Pp. 1199. Leipzig: Tauchnitz, 1909. Price 55 marks.

† This distinguished Scottish geologist wrote the review here printed of Penck and Brückner's great work upon the glaciation of the Alps. The paper appeared in the *Scottish Geographical Magazine*, pp. 481-91, 1909, and is reproduced in the *Bulletin* by its courtesy.